

FLIGHT

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ENGINEER
&
AIRSHIPS**

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

1922.

- Mar. 2 Lecture, "Testing Aircraft to Destruction," by W. D. Douglas, before R.Ae.S.
- Mar. 16 Lecture, "Radiological Research," by Dr. V. E. Pullin, before R.Ae.S.
- Mar. 26-
April 2 Nice Meeting
- Mar. 30 Lecture, "The Design of a Commercial Aeroplane," by Capt. de Havilland, before R.Ae.S.
- Mar. 31 Lecture, "Aircraft Design" by F. P. Folland, before I.Ae.E.
- April 17 R.Ae.C. Race Meeting, at Waddon
- June 1 Entries close for Schneider Cup Race
- June 5 R.Ae.C. Race Meeting, at Waddon
- July 6-20 French Gliding Competition
- Aug. 6 Gordon-Bennett Balloon Race, Geneva
- Aug. 7 R.Ae.C. Race Meeting, at Waddon
- Aug. (last fortnight) Schneider Cup Seaplane Race, at Naples
- Sept. Tyrrhenian Cup, Italy
- Sept. Italian Grand Prix
- Sept. or Oct. R.Ae.C. Race Meeting, at Waddon
- Sept. 22 ... Coupe Deutsche (300 kil.)

EDITORIAL COMMENT



UNFORTUNE appears to have been dogging the footsteps of airships during the last year or so. First came the accident to R.38, involving a heavy loss of life, and now the wreck of the semi-rigid airship "Roma" purchased from Italy by the United States Army. It is a curious coincidence that the report of the Accidents Investigation Sub-Committee should be issued almost simultaneously with the sad accident to the "Roma," which resulted in further increasing the death-roll of those whose pioneer work is paving the air-way for future generations. To the American Nation, no less than to the relatives of those who perished, our sympathy goes out in their sad bereavement. The loss of R.38 and her gallant crew, in which America shared, is still so fresh in mind that the wreck of the "Roma" is felt all the more keenly. Both calamities occurred at a time when the fate of airships was in the balance, and as far as this country is concerned it is to be feared that the loss of R.38 has not helped to make the exploitation of airships any the easier, for the time being at any rate. In America also, voices are not wanting which are crying "Enough," although these are silenced by plans which appear to be maturing to thoroughly test airships commercially in the United States. Moreover, it would appear as if both calamities might have been avoided.

Details relating to the cause of the accident to the "Roma" are still lacking, but from such reports as have reached this side it seems that the primary cause was the failure of the elevators, followed by a nose dive, which brought the airship into contact with some high-tension electric leads which, on breaking, set the hydrogen on fire. It appears reasonable to suppose that but for this fact the crew might have been saved, as the crash of the airship on the ground would probably not have set it on fire, or not, at any rate, until the crew would have had time to get clear.

Surprise has been expressed that the airship should dive into the ground when the tail broke. While at first this fact may appear somewhat surprising, a few moments' consideration will show that it was quite a natural sequel to the breaking of the tail. According to reports, the airship was proceeding at

a good speed and at a comparatively low altitude, variously given as 1,000 and 1,500 ft. As the airship itself is approximately 400 ft. long, it will be seen that its height above the ground was not more than four lengths at the most, and that consequently the momentum of the airship would carry it on, especially as there may have been some slight delay in stopping the engines.

It is to be observed that the breaking of the R.38 also took place at a relatively low altitude, and that it is stated in the report that, as the forces are proportionate to the air density, the latter ship was not strong enough to withstand the stresses set up at high speeds and low altitude. If the "Roma" had been at 2,000 to 3,000 ft. at the time the tail broke the ship might probably have been saved, as it now seems fairly well established that she did not catch fire until striking the electric wires.

A further point of similarity between the two accidents is that both were, directly or indirectly, due to the forces on the tail. In the case of the "Roma" the tail gave way, while in R.38 the tail pressures resulted in breaking the longitudinal girders. In other words, both accidents were due to aerodynamic forces set up during manœuvres and not to any weakness existing when regarded statically. One is forced to the opinion that both accidents point to an urgent need for further research, both in the wind tunnels, on models, and on full-size airships in flight. It is known that all streamline shapes are unstable to a greater or smaller extent, and that an airship requires a good deal of control in order to keep her on any given course. While model experiments can, and do, give a great deal of information, full-scale research is also required, and it seems to us that, as the problems involved refer largely to first principles, it might well be worth while for the various nations to try to co-ordinate their research on subjects connected with airships. Otherwise there is bound to be a good deal of overlapping and duplication of work. We fully realise the difficulties, but with good will they should not be insurmountable. There is little doubt that, if some agreement could be reached as to which experiments each of the larger nations should undertake, much valuable time might be saved, and the rate of progress, which is otherwise bound to be slow, would be considerably accelerated.

The Report on R.38

The Report of the Accidents Investigation Sub-Committee into the details which led to the accident to R.38 was issued during this week, and a brief résumé of the conclusions of the Committee is published elsewhere in this issue. Several facts emerge from the report. To begin with, it appears to be established that the accident was undoubtedly due to faulty design, and not, as has been maintained in some quarters, to manœuvres being undertaken which were really outside the scope of the tests. In fact, the use of rudders and elevators does not appear to have been other than what might have been necessary during a straight forward flight in bad weather.

The fundamental cause of the disaster appears to have been the failure of the designers to have taken into consideration stresses due to aerodynamic forces, as distinct from static forces. Judged on a basis of static forces R.38 was fairly strong, apparently, the weights being well distributed. And yet we are told that information existed which would have thrown grave doubt on the structure. Indeed,

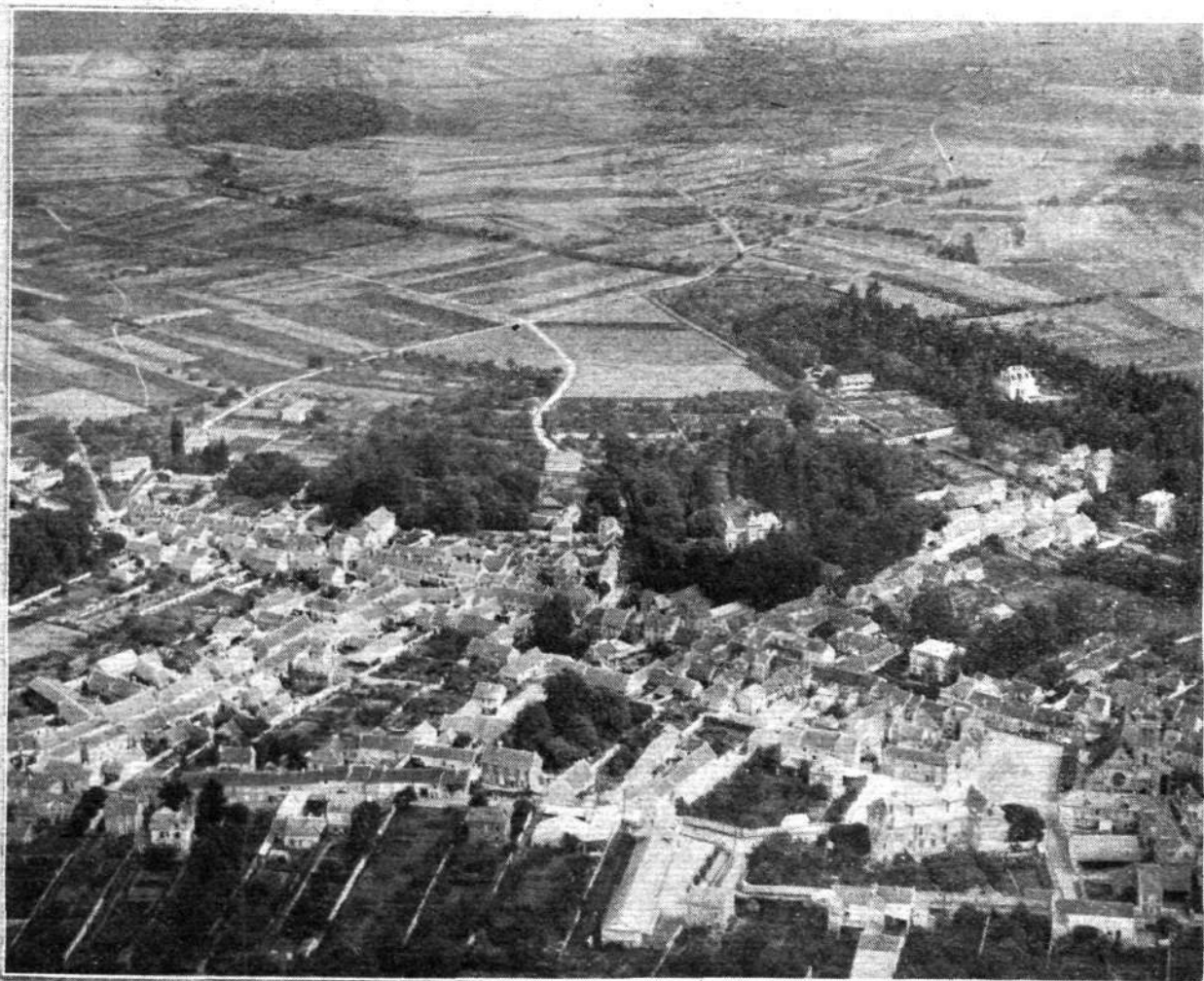
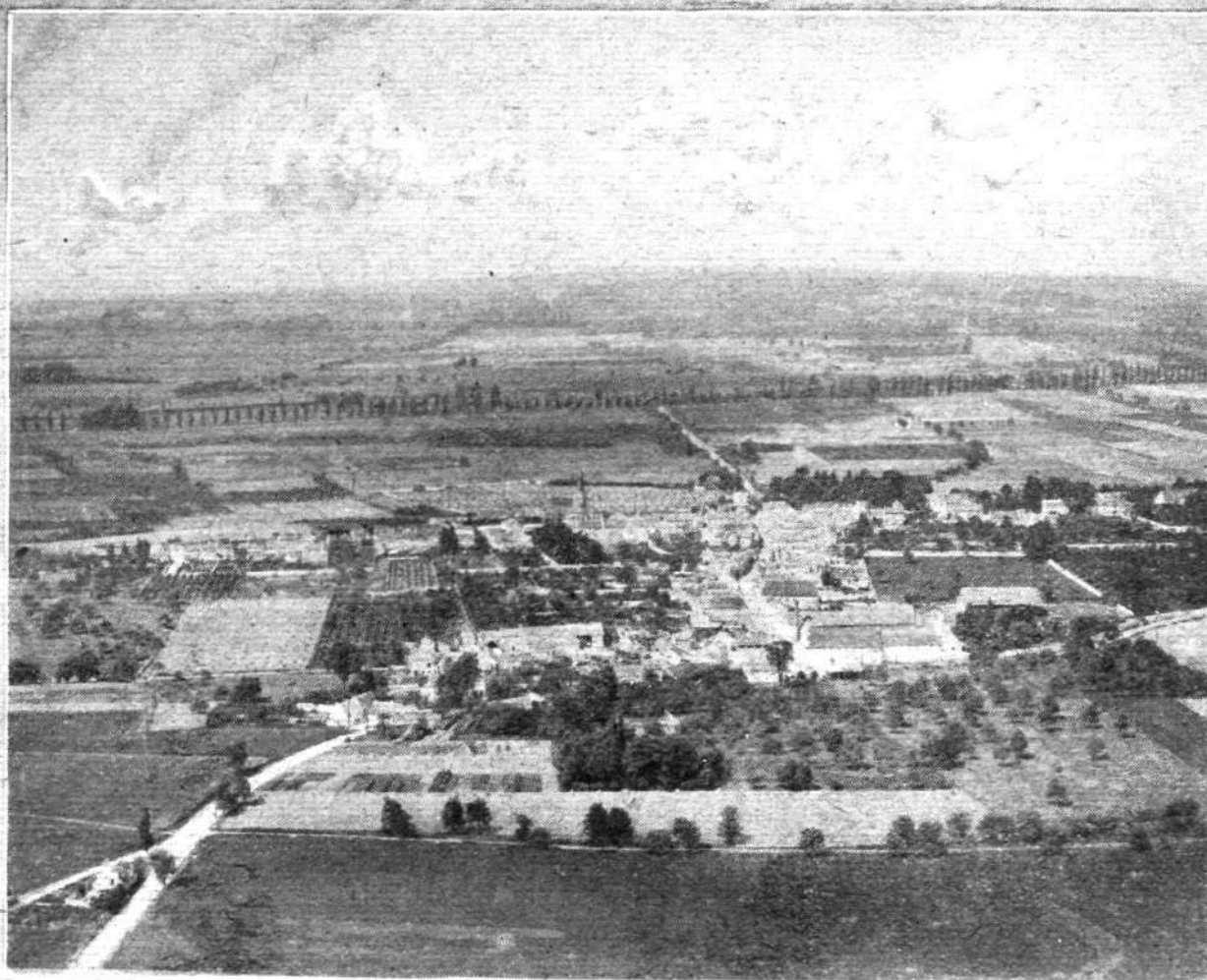
in the case of R.29 calculations as to the aerodynamic forces had been made, but they showed such a large resultant bending moment that, in the opinion of the designing staff, such a basis of design was precluded by considerations of weight. R.29 was then designed to factors of safety based on static stresses, and, as she showed no signs of failure, it was concluded that it was safe to design on a static basis, and the model results, uncorroborated as they were by full-scale experiments, were not thought to be reliable enough to be considered.

Certain sections of the report throw a striking sidelight on the way in which, under the name of economy, we have neglected to carry out experiments which would in all probability have furnished data that would have convinced the designers of R.38, and thus might have saved the many gallant lives whose value cannot be assessed in mere pounds, shillings and pence, not to mention a very valuable ship. For instance, in para. 21 of the Report it is stated that "For some time prior to the trials of the ship the design staff of R.38 had pressed for full-scale experiments which would determine the aerodynamic forces acting on the hull of an airship and on its fins and control surfaces, and had fitted the necessary apparatus into R.32, with a view to making a series of such tests. Owing to the early deletion of the ship, only incomplete observations were possible, but these showed unexpectedly high fin pressures. Apparatus for the same purpose was also fitted into R.33, but the ship was put out of commission before the tests were begun."

Comment is, we think, superfluous. Research is needed, both model and full-scale, and the existing ships could be utilised for experiments which would be of the greatest value in future design. In this manner we should be able, in the long run, to consider that we had got value for money expended. If they are allowed to "rot in their sheds," the money must be written off as a dead loss. We are a nation of shopkeepers, to be sure, but even from that not very exalted point of view the idea of making some use of the ships should appeal to us more than writing them off, even if we do have Ministers of the Crown suggesting that we should sit down with our hands in our lap for the next ten years or so.

The Air Conference

Last week it became necessary for us to hold over the paper read before the Air Conference by Major Scott, and the discussions which took place during the afternoon session of the second day of the Conference. In the present issue these are published, and thus we close our review of an event which should have considerable effect in letting the man in the street, the businessman, the financier—in short, all who are not intimately connected with aviation—know the present position of aviation, what it has to offer, and at what price. That, as we see it, is the object of the Air Conference. It may be admitted that this object was not attained this year. The papers read were too long and too technical. Next year let us stick to matters of policy, matters of national and international interest, but for heaven's sake let us present a more united front to the outside world than we did in the Guildhall recently. The impression left on the non-technical section of the audience must have been that the aviation world does not know what it can do and cannot do, nor how much it will cost to do it.



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LONDON-PARIS FROM THE AIR, AS SEEN FROM A HANDLEY PAGE MACHINE:
No. 27.—Typical French landscapes near Paris. Note the long poplar-lined roadway.

THE AIR CONFERENCE, 1922

(Concluded.)

AIRSHIPS

By Major G. H. SCOTT, C.B.E., A.F.C., A.M.I.M.E.

MAJOR SCOTT'S paper on airships was mainly a *résumé* of the present position of airships throughout the world, and much of the paper dealt with matters which are already well-known to readers of this journal. This is not in any way meant as a criticism of the paper. On the contrary, it was eminently fitting that our leading airship pilot (and one of our foremost airship experts) should place before an assembly such as the Air Conference the facts relating to the airship position, and without being too technical Major Scott managed to do so in a most admirable manner. If there was any fault at all to find with his paper it was in understating rather than overstating the case for airships. He chose to err, if error it was, on the conservative side. It may, therefore, be accepted that every statement made and every claim put forward by him can be substantiated now, without introducing any element of speculation.

In his introduction Major Scott expressed the view that, if a move is not made now, one will be forced upon us within the next couple of years, and he proceeded to explain the reasons which led him to that conclusion. In America the U.S. Navy Department have arranged with the Allies for the construction of a Zeppelin airship for America as part of America's share of aerial reparations. This ship, Major Scott stated, will embody the latest features of airship design and should be flying within 12 months. The U.S. Navy Department is also building in America the Z.R.1, modelled on a German airship, and the U.S. Army has recently purchased the Italian semi-rigid airship "Roma," which is the largest semi-rigid ship in the world. In addition to the purchase of airships, America is establishing large and elaborate airship bases, and a powerful commercial combine has in view the running of commercial airship services, trans-Continental at first, with the trans-Atlantic service as a later development.

In France there is also considerable airship activity. Three surrendered airship sheds are being re-erected, one near Paris, one near Marseilles, and one in Algiers.

Italy recently constructed a $1\frac{1}{2}$ million cubic ft. semi-rigid, which, as already stated, has been sold to America. They are now engaged on building a still larger airship of similar type, which will have a range of about 4,000 to 5,000 miles. Italy also has under consideration a commercial airship service from Rome to her North African colony Tripoli.

Germany has in various ways managed to keep her technical airship staffs together, and they are still in a position to design and construct airships. An arrangement is now being completed between Spanish commercial interests and the Zeppelin company to establish an airship service between Spain and the Argentine. This latest move was regarded by Major Scott as one which may well turn out to be of far-reaching importance, and may even result in giving Germany a commanding position in the airship world.

As regards Imperial air services, Major Scott pointed out that the work between main terminals in each country can only be carried out by airships, the terminals being fed by aeroplane branch lines.

On the technical side the lecturer stated that it can be affirmed with certainty that an airship can be built today whose performance in all directions can be established beforehand, and which will not introduce any experimental and untried features. The type of airship which Major Scott would suggest as suitable would have a capacity of 2,500,000 cubic ft., giving a gross lift of 75 tons and a useful lift for freight of 12 tons for non-stop journeys of 2,000 to 2,500 miles. This would enable 35 passengers and 7 tons of mail and other goods to be carried, without an intermediate stop, from England to Egypt. A journey of this distance could be completed in 50 hours, or at a speed made good of 50 m.p.h. The hull would be of a rugged construction, built for a long life and low maintenance cost, and should last in continuous service for at least five years. The airship would be built with a factor of safety at least equal to that of R.33 and R.34, which showed themselves capable of standing up to the worst weather conditions both in flight and at the mooring mast.

Major Scott stated that during the last year he had made a very careful study of the weather charts covering the route to India, and he had come to the conclusion that the leg of the route from England to Egypt could be run with a regularity comparable with that of steamships, and the

distance covered regularly in 50 hours. There is no reason to doubt that an equal regularity could be maintained between Egypt and India. Allowing a stop of half a day in Egypt, India would be reached in $4\frac{1}{2}$ to 5 days, giving a time-saving of approximately 10 days, or 66 $\frac{2}{3}$ per cent. over existing means of transport. The last stage of the route, from India to Australia, is somewhat more uncertain, and the lecturer did not feel justified, with the limited meteorological data at present available, in assuming the same regularity over this portion of the route, although he thought there is absolutely no reason to doubt that this stage could be flown. Even with the service terminating in India, the saving in time to Australia would amount to about 33 $\frac{1}{3}$ per cent. over the fastest steamship times.

The lecturer then turned his attention to a more detailed reference to the various parts of an airship. A $2\frac{1}{2}$ million cubic ft. hull could be built without introducing any experimental feature. By employing the German way of attaching the goldbeaters' skin to the fabric of the gas bags, using a gelatine glue instead of the rubber solution which we have been employing for the purpose, gas bags can be made which will give satisfactory results under all climatic conditions. Major Scott stated that as yet no British engine designed specially for airship work has been developed, and referred to the German Maybach, which has given most satisfactory results. He thought that a probable development in the near future will be the introduction of heavy-oil engines, which would tend to reduce running costs.

Under the heading of safety the lecturer stated that there are two dangers—fire and weather conditions. The fire danger falls into two classes—danger due to petrol and danger due to hydrogen. Of the two the petrol danger is the more serious. The introduction of the heavy-oil engine would almost entirely remove this danger. Regarding the danger due to hydrogen, Major Scott stated that in all cases of fire in an airship, excepting those due to enemy action, the ignition of the hydrogen had been a secondary cause only.

Although it is generally imagined that an airship is in considerable danger from lightning, Major Scott pointed out that this is not the case, and that the danger is due to the violent air currents obtaining under such weather conditions. Even with present meteorological organisation, it is, however, comparatively easy to avoid thunderstorms, he said. Snow may constitute a danger if it collects on the airship, but by rising about 1,000 ft. above the level where damp snow or sleet are met with the airship will get into dry snow, which blows off and does not collect.

The results of experiments made with mast-mooring were summarised by Major Scott as follows: (1) the airship can remain at a mooring mast comfortably in winds up to 60 m.p.h., riding through hail and snow squalls; (2) it can leave the mast in a 40 m.p.h. wind; (3) it can land at a mast in winds up to 32 m.p.h.; (4) necessary running repairs can be undertaken with safety at the mast.

In the foregoing estimates of performance, etc., Major Scott pointed out that he had not taken into consideration any future developments. One of the more important of these, and which is now in sight, is the utilisation of waste hydrogen as fuel. Experiments indicate that by this means a considerable economy in fuel may be expected, the direct result of which will be to increase the commercial load of the $2\frac{1}{2}$ million cubic ft. airship by something in the order of 40 per cent. over a 2,000 or 2,500 mile journey.

Finally Major Scott gave his views on the value of the airship for Imperial defence. Although admitting that during the War the airship was largely immobile, Major Scott stated that with the development of the mooring mast this is no longer so, and that therefore concentration at any point would be secured at a maximum of speed. The lecturer admitted the vulnerability of the airship from the military point of view, but referred to this being diminished or eliminated by the use of helium or by the use of an outer envelope of non-inflammable gas. Even the present limitation due to vulnerability, Major Scott maintained, will only apply when an airship is operating over waters controlled by the enemy. Over the large sea areas and along the main trade routes, attack by enemy heavier-than-air craft will necessitate the use of aircraft carriers, and if the enemy does not control these waters, his aircraft carriers

will not be able to operate with any hope of success. Also Major Scott thought that the airship would provide a good gun-platform with heavier armament than the attacking aeroplane would possess, and should therefore be able to give a good account of itself.

In conclusion Major Scott pointed out that the reason for the comparative failure of the airship in the War was due to the absence of mooring masts, and he pleaded for the establishment of the necessary ground organisation in the Dominions and India, justifying his plea as follows: "The estab-

lishment of the necessary ground organisation in the Dominions and India is, therefore, of primary importance not only to improve Imperial communications and to develop commercial possibilities, but in no less degree to utilise the airship to the utmost for Imperial defence. The erection of these bases for an Imperial airship service, to repeat the point in another way, would immediately make the airship of considerable value for Service purposes, and, conversely, the establishment of bases for Service airships would also be of great assistance in furthering commercial airship projects."

THE DISCUSSIONS

THE afternoon session of the second day of the Air Conference was devoted to a discussion of the technical papers read during the afternoon session of the first day. Lord Weir was in the chair, and asked Capt. Geoffrey de Havilland to open the discussion.

Capt. de Havilland agreed with Major Green that the duplication of stressed parts was of great importance. The danger from fire, he thought, can be eliminated by suitable placing of the tanks, careful design of petrol leads, and the use of fireproof bulkheads. From the point of view of the comfort of passengers the elimination of noise was important. As regards the question of single-engine *versus* multi-engine machines, he was of the opinion that the single-engined machine had proved at least as safe and reliable as the twin-engined. He could not quite agree that at present the all-metal machine was practical, and thought the time for it had not yet arrived. The life of a wood machine was, he said, longer than generally believed, and wood had the advantage that for experimental work it afforded cheapness of construction. The life of a wooden machine could, he thought, be tested very cheaply, and it might be useful to carry out such tests. It was sometimes claimed that the fabric-covered wings got soggy, and that, in consequence, the machine lost its performance. He did not believe that this deterioration in performance was as serious as generally thought. Among the subjects for research and experiment he mentioned control at low speeds, and high-lift wings. One difficulty which firms encountered at present was that as soon as a machine was finished it was taken away from the constructor, and he thus got no opportunity of testing it thoroughly. He would plead for support from the Government to enable firms to do more full-scale flying tests.

Lieut.-Col. Mervyn O'Gorman disagreed with Lord Gorell on the question of technical qualifications. He did not think that it could ever be undesirable to possess technical qualifications, and pointed out how in the future firms who purchase their machines must have a man who understands the technical side if they are to get the best machines for their particular purpose. The designer must also know the user's point of view, and *vice versa*. In view of the enormous value of scientific knowledge, he would plead for making the training of cadets sufficiently technical.

Prof. L. Bairstow quoted the American National Advisory Committee recommendations for extensive research, and associated himself with the views therein expressed. With reference to Major Green's remarks relating to the application of model results to full-scale machines, he thought the reply would come from our Universities and from the mathematicians. As regards the lack of contact between designers and research, he associated himself with the views expressed by Col. O'Gorman. He referred to the progress made in applying research data to practical design, and maintained that today we should be surprised if a machine differed by as much as 10 m.p.h. from the performance predicted from model tests. Prof. Bairstow also regretted the present system of taking a machine away from a designer as soon as it was finished, and pointed out that this did not give the designer an opportunity to become thoroughly acquainted with its behaviour. He referred to the statement which too often appeared after an aeroplane crash, "that it was due to bad piloting and stalling of the machine." He thought this unfair to the pilots, as a machine was extraordinarily tricky to handle at low speeds, speeds somewhere near the stalling point. On the question of airships he associated himself with Major Scott in the opinion that a serviceable airship can be produced today which will not introduce any untried features in its design.

Prof. Burstall, of Birmingham University, said that with regard to aircraft he could speak of the engine only with authority. He thought that the petrol engine, as we know it today, had practically reached the limit of its development, and the next step appeared to be direct injection of the fuel. He had had a good deal of experience in this subject,

and they had found that, working on the Diesel cycle, air injection was the most economical. The necessary apparatus was, however, too heavy for aircraft use, and the most promising form appeared to be solid injection. Here one was faced with the difficulty of getting the fuel properly atomised, and it had been found that engines could not be got to run at anything but relatively low speeds. What was really wanted, he thought, before we go to the expense of building engines, was more basic research on fuel injection. He mentioned some interesting experiments with photographing the spray as it entered the cylinder, and thought that work of this kind could teach us a great deal, while it would be very much cheaper than building complete experimental engines.

Sir Richard Glazebrook thought that the urgent need for and full importance of research was not realised in high quarters. He mentioned that a man engaged on research work, as apart from experimentation, should be left absolutely free to work at the times and in the manner which suited him. As regards Major Green's remarks on scale effect, he did not think that he (Major Green) quite realised all that had been done lately. With reference to safety, what was wanted was more research on stability, chiefly lateral, and circling flight. For this work both wind tunnel and full-scale work was needed. Research on the distribution of air pressure was also needed. Sir Richard then outlined the work of the N.P.L. for February. In the big channel: first, stability on models, then airscrew tests, then stability work, then tests on international models so as to find means of co-ordinating and obtaining agreement between the results obtained in the various countries' wind channels, then pressure distribution. With regard to airships, Sir Richard realised the need for economy, but he pointed out that the need for research on airships was very pressing. He said he was giving away no secrets if he stated that information existed which would have thrown grave doubts on the strength of R.38 had it been used, although it was not of a sufficiently conclusive nature to be entirely trusted by the designers. He agreed with Prof. Bairstow and Major Scott that a commercial airship could be built without introducing experimental features, but if a light airship such as R.38 was contemplated, then further research would be necessary before we could confidently approach the actual construction. He suggested that a sum, which need not be very large, be set aside for full-scale experiments on existing ships.

Mr. Alan Chorlton, of Beardmore's, said that at the last Air Conference he suggested a division of work. The neglect to do this had, he thought, been unfortunate, and he again suggested a better division. With regard to Major Green's difficulty in bringing into agreement the apparently opposing views on bearings, he thought that it would be found to be mainly a question of temperatures. On the question of engines, Mr. Chorlton pointed out the need for lightness, and said that we had had ample proof of the advantage of lightness. The light engine was the engine which had got all the business. For further improvement he thought we should attack the problem metallurgically rather than thermodynamically. He concluded by pointing out the desirability of getting the great industrial firms into closer touch with the Directorate of Research.

Prof. E. Melvill Jones, of Cambridge University, pointed out the danger of a widening of the gap between the scientific side of aeronautics and the flying people. He pleaded for a good technical training of officers, and also suggested that the Air Ministry should consider an arrangement for a small reserve, chosen from the Universities, to be given one or one and a half year's flying experience in the R.A.F. Much had been said about safety and regularity, yet he was surprised to find that such very valuable instruments as turn indicators were not fitted on the cross-Channel machines. He thought they certainly ought to be fitted. On the question of airships he said that it had been stated that

there was no great future for aircraft except over long routes. It had also been said that the airship was the craft for long-distance flying routes. It seemed to him that logically the chain of argument was complete, and that it was in favour of airships. And yet we were just turning airships down. He suggested that, whatever happened, we should at any rate keep one or two ships for research. With regard to Capt. Guest's statement that it would be as cheap to wait some years and then make a fresh start, Prof. Jones pointed out that in that case we should have to rely entirely upon the experience gained by others, a procedure which, to put it on its highest plane, would seem to amount to brain-picking, and was scarcely dignified.

Mr. J. D. North said that he was left with the impression after hearing Capt. Guest speak that aviation was in a state of anæmia. After all he had heard by now, he was inclined to think it was indigestion, for which Gen. Brancker had that morning administered a strong dose of ginger. As regards metal construction of aircraft he would support Major Green. All-metal machines could now be built which were 10 per cent. lighter than wooden machines, and were no more expensive. Improvements were now in sight which would make the metal machine 25 per cent. lighter than the wood machine.

Mr. H. P. Folland was surprised that after three years of peace, machines were practically the same as when the War finished. He thought we should strike out along new lines, and expressed the opinion that with his large double triplane, which unfortunately came to a premature end, the Italian constructor Caproni was probably on the right track. He did not agree with either Capt. de Havilland or Mr. North, but thought that at present a machine should have its main members of steel and fairings and lightly-loaded members in wood. With reference to research, he referred to the helicopter experiments, and pointed out that before all else a helicopter engine must be reliable. He therefore thought it would be better to spend that money on engine experiments instead. He wanted comparative tests on bodies with water-cooled and air-cooled engines, air-cooled engines in pusher machines, etc. The present commercial types were really military machines with limousine bodies. With the system of designing machines to specifications in competition with other firms, a specification will produce almost identical machines from the different firms. He thought there was need for some international rules on landing speed, factors of safety, petrol systems, etc. At present foreign firms can fly with lower factors of safety, and thus effect a saving on structure weight which increases the commercial load. This is a handicap to British constructors.

Capt. G. R. Hill said that as regards safety the figure of 1,000 something passenger killed per thousand carried conveyed nothing to him. He had recalculated the figure, and found that, by comparison, it was equivalent to 300 people being killed in the London tubes every day. The public were quite right in regarding flying as rather dangerous. Something would have to be done. Progress is being made, but only slowly. He had a scheme for providing aeroplanes with two engines, either of which would be sufficient to bring the machine home.

Major Hely Pounds was also one of those who were surprised at the statements made by Capt. Guest, and thought it extraordinary that a suggestion to disband our personnel and re-establish it again after a number of years should come from a minister of the Crown. As regards the lack of public interest, that was, he thought, merely a matter of window-dressing. Subsidies were justified if the public was benefited by the services for which the subsidies were being paid. As regards the supply of timber, he suggested that the authorities should get in touch with the Dominions so as to make full use of any suitable timbers that might be available. Now was the time to look into the matter, as

it took about 40 years to grow a tree of sufficient size to be of real value.

Major Blake referred humorously to the time *not* saved by the air mail. What was wanted, he said, was a guaranteed load. There were many cross-country routes in the United Kingdom suitable for air services. The England to Ireland route was one. He thought that it would soon be possible to fly at night. With regard to the carriage of goods by air, he had recently had an offer of 6d. per pound. He did not quite understand how Capt. Hill arrived at his basis for 300 passengers killed on the tubes, as during the last six months on the cross-Channel services not a single passenger was killed or injured.

Mr. F. Handley Page said that as regards research and design he thought that the method of sending out specifications of what was wanted, as is done for military machines, should also be applied to commercial machines. In his opinion progress was likely to be along the lines of machines requiring less power to fly, and he pleaded for more competitions for civil machines. He agreed with Gen. Bagnall-Wild that if normally used at only a small percentage of their maximum power, aero engines would be found at least as reliable as car engines, and thought improvement would come with improvements in the machines themselves rather than in the engines. Major Green had referred to landing in small fields. This was mainly a question of the amount of control available.

Brig.-Gen. Sir Sefton Brancker said that he had a definite suggestion to make, namely, the desirability of stable commercial aeroplanes. With such machines we could fly in any weather. As regards the statement of the D. of R. in his paper that inherent stability would do away with the necessity for automatic stabilisers, he did not quite agree, as he thought that a stable machine had to move considerably before the righting forces came into play, whereas with automatic stabilisers the correction was applied before the machine had deviated perceptibly from its normal attitude. He was strongly in favour of metal construction, especially for work in the East, where metal construction was desirable, and metal airscrews almost a necessity. He again referred to the advantage of air-cooled engines, and said that a really reliable air-cooled engine was wanted. We should also have to abolish rubber, not only for petrol pipes, but for the tyres as well, he thought. On the subject of statistics, he was no more impressed by Capt. Hill's 300 corpses per day than he was by the 1,000 ones per thousand passengers carried.

Capt. Guest, Secretary of State for Air, said that he had come in for a good deal of criticism, but was not criticism the object of the Air Conference? It gave an opportunity for the thrashing out of views. He thought the thanks of the aviation world were due to all the many who had spent two days of strenuous attentiveness at the Guildhall, and assured his hearers that all the suggestions made would receive very serious consideration. He mentioned the fight for its existence which the Air Ministry had been through during the last four months. With regard to his pessimism as concerns European aviation, he said that what he had in mind was Imperial aviation in preference to European aviation. On the question of airships, he intended to keep a pivotal staff of airship experts against the time when we should be in a position to afford the building and running of airships. Finally he pointed out that there is not a man in the Air Ministry but what he is keen on aviation and a great believer in it. But when you are speaking to the A.M., he said, you are speaking to the converted. He wanted to see people outside the Air Ministry and aviation world interested in the subject.

Lord Weir, in closing the Air Conference, said he thought the assembly had two duties. One was to thank the Press for all it had done, and the other to thank the Lord Mayor for the loan of the Guildhall for the Conference.



Official Opening of the R.A.F. Club

ON Friday of last week the Duke of York, accompanied by Wing-Comdr. Louis Greig, officially opened the Royal Air Force Club. He was received by Brig.-Gen. R. H. More, the chairman, Lord Cowdray, Air-Marshal Sir Hugh Trenchard and members of the committee.

The Duke made a tour of inspection of the new premises, including the kitchens, the racket courts and the ball-room, and at the conclusion of the inspection Lord Cowdray handed to his Royal Highness a box containing the deed of gift of the Club, which Lord Cowdray has presented to the R.A.F. After declaring the Club open, the Duke handed the deed to General More, representing the trustees, and on behalf of the

officers of the Force expressed their great appreciation of Lord Cowdray's generosity.

French Air Mail Fees Cut in Half

As from Wednesday of this week, the surtax in France on letters sent by air mail from Paris to London has been reduced from 50 centimes to 25. Good!

An Air Service in Queensland

ARRANGEMENTS are reported from Queensland for the opening of an air service between Cloncurry and Charleville, a distance of 570 miles, with a 250 miles extension to Mundigindi, a railhead on the New South Wales border. Both passengers and mails are to be carried.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

EASTER AVIATION MEETING

THE Royal Aero Club will hold an Aeroplane Race Meeting at Waddon Aerodrome, Croydon, on Easter Monday, April 17, 1922. The programme of events includes the following Races:—

Club Handicap.—For machines "Avro" type, engine power not to exceed 150 h.p.

Distance approximately 24 miles.

Entrant of the Winner will receive £20. If five starters, the second will receive £10.

Second Waddon Handicap.—For machines with a speed of not less than 100 m.p.h.

Distance approximately 32 miles.

Entrant of the Winner will receive £20. If five starters, the second will receive £10.

Second Croydon Handicap.—For machines with a speed of less than 100 m.p.h.

Distance approximately 24 miles.

Entrant of the Winner will receive £20. If five starters, the second will receive £10.

First Spring Handicap.—For machines occupying the first three places in the Waddon and Croydon Handicaps.

Distance approximately 32 miles.

Entrant of the Winner will receive £40. If five starters, the second will receive £20.

In addition to these events there will be a Balloon Sniping Competition open to Members of the Royal Aero Club, and a parachute descent.

The entry fee for each of the Handicap Races is £1. This fee, together with entry form, must reach the Royal Aero Club, 3, Clifford Street, London, W. 1, not later than 5 p.m. on Friday, April 7, 1922.

Club Flying Machines.—The following Club flying machines are available for the Races:—

B.E.2c (Two-seater) 90 h.p. R.A.F.

Avro (Two-seater) 110 h.p. Le Rhone.

Avro (Two-seater) 110 h.p. Le Rhone.

Avro (Two-seater) 110 h.p. Le Rhone.

Qualified pilots wishing to take part in the Races may hire any of these machines from the Royal Aero Club at £3 for each event, which will include cost of petrol and oil and insurance of machine.

Applications for the hire of these machines should be made direct to the Secretary of the Club.

Offices: THE ROYAL AERO CLUB,

3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

NOTICES TO AIRMEN

Spain: Cuatro Vientos Aerial Lighthouse

THE following details have been received regarding an aerial lighthouse which has been installed at Cuatro Vientos aerodrome, Madrid

The lighthouse is situated on a cylindrical tower erected on a stone building near the south-west corner of the aerodrome buildings, at a height of 25 m. (82 ft.) above the aerodrome level.

The illuminant is acetylene gas, and the light emits between 4,000 and 5,000 c.p., concentrated in a beam 4° above the horizontal, and visible for 25 kms. (15 miles approximately). The characteristics are the Morse letters H T I, with equal intervals between the letters so that they may be read in any order, as follows:—

Four flashes of $\frac{1}{2}$ sec. each; eclipse of 2 secs.; one flash of 3 secs.; eclipse of 2 secs.; two flashes of $\frac{1}{2}$ sec. each; eclipse of 2 secs.

The light is put into operation only when machines are expected. Pilots who intend to make a night landing at Cuatro Vientos should, therefore, give due notice to the Commandant of the aerodrome.

(No. 19 of 1922.)

Belgium: Erection of Wireless Masts at Ostend Aerodrome

THREE wireless masts, 12 m. (40 ft.) in height, have been erected in the north-east corner of the Ostend aerodrome.

These masts are marked by day by two red flags, and by night and in fog by two red lights.

(No. 20 of 1922.)

France: Aerial Lighthouses, Etc.

PREVIOUS Notices to Airmen relating to France are amplified and amended in regard to

1. *Aerial Lighthouses* at (i) Strasbourg (Neuhof); (ii) Valenciennes; (iii) Le Bourget, St. Inglevert, Lyons (Le Bron), Nîmes, Bordeaux (Teynac).

2. Emergency landing-grounds at Carcassonne (Salvaza) and Orleans (Saran). (No. 21 of 1922.)

Aerodromes for Civil Use: Amendments.

NOTICE to Airmen No. 1 of 1922 (Consolidated List of Aerodromes) is amended as follows:—

LIST C.—LICENSED CIVIL AERODROMES.

The following should be deleted:—Portobello, Craigen-tinny; Radcliffe, Lancs. (No. 22 of 1922.)



THE D.H.14 DAY-BOMBER ROLLS-ROYCE "CONDOR" ENGINE: A description and scale drawings of this machine were published in our issue of January 13, 1921. The machine paid a visit to Croydon on the day of the Air Conference.

LONDON TERMINAL AERODROME

Monday Evening, February 27, 1922.

UNABATED activity prevails in the erection of new offices. Grands Express have got the roof on their new waiting-room, and the Daimler Hire offices are rapidly taking shape. In the Instone Air Line's premises interior work is being hurried forward, now that the outside is finished and receiving its final coat of varnish.

The Bristol 10-seater made its maiden trip to Paris on Saturday with five passengers and a heavy load of parcels and mail. Mr. Olley was the pilot, and, owing to the strong wind, which reached gale force at times, the journey occupied 3 hours 25 minutes. In spite of this, and the bad "bumps," the passengers were very pleased with their journey, and spoke highly of the comfort of the machine. This machine is, of course, operated by the Handley Page Transport.

Mr. Cogni informs me that the Handley Page torpedo-carrier was successfully tested at Cricklewood yesterday, and further tests have been made today. Mr. Wilcockson, who piloted this machine, is, I understand, very pleased with it.

Business on the "airways" is becoming quite brisk, and Handley Page Transport are getting as much traffic as, at present, they are able to cope with. They are looking forward to the time when they will have the four new W.S.B.'s, with Rolls-Royce engines, which are now building at Cricklewood.

A Fleet of Vickers "Vulcans"

THE Instone Air Line are, I understand, to have a fleet of new machines built by Vickers, which are to be known as the Vickers "Vulcans." These will be of two distinct kinds, one equipped for goods only, and the other for passengers.

Mr. Didier tells me that the S.N.E.T.A. are opening up the London-Brussels service again on April 1, and will have a fleet of half-a-dozen "Goliaths" with Maybach engines. The "Goliath" is, apparently, appealing to the foreign firms. With the exception of the Napier-engined Vickers "Vimy," the entire fleet of the Grands Express—some twelve in number—consists of "Goliaths." The Messageries Aériennes have also bought some "Goliaths" which are to be fitted with Renault engines; and now comes the news that the Belgians are to run "Goliaths." It is probable that there will be more "Goliaths" than any other type of 'plane on the continental "airways" this year.

The Messageries Aériennes' "Goliath," fitted with the Aveline stability device, has been making demonstration

flights at Croydon again this week. On one occasion representatives from the Air Ministry went for a flight, and were much interested and impressed by the steadiness of the aeroplane when controlled by this "mechanical brain."

Still talking of "Goliaths," the Grands Express have now named their machines. "Londres," "Paris" and "Verdun" have all been seen at Croydon this week.

An "Air Special's" Struggle with the Wind

A SPECIAL F.2 left Amsterdam for Croydon on Saturday with Mr. Duke as pilot. There was a very strong head-wind. In fact, at the height the monoplane was flying, it would be somewhere in the region of 50 miles-an-hour, and Mr. Duke was four hours flying from Amsterdam to Lympne—where he was forced to stay the night owing to darkness.

He left for Croydon on Sunday morning, and again had a stiff head-wind, taking 50 minutes to do the journey.

After arriving at Croydon, and while "taxying" the monoplane round to the sheds, a sudden gust of wind caught the machine and tipped it over on its nose, the wing being rather badly damaged.

The new weather display board is now in full working order, and is a distinct improvement on the old idea, the reports being easy to read, while they give a better idea of the general weather.

Further details of the unfortunate ending to Mr. Alan J. Cobham's air-taxi tour of Europe and northern Africa are now to hand. After flying for nearly 7,000 miles on the same D.H.9, and with the same "Puma" engine—acting as his own mechanic and landing in all sorts of unknown places—Mr. Cobham was approaching Venice at a low altitude in foggy weather, and was actually in sight of the aerodrome, with which he was familiar, when a dense fog-bank, accompanied by drizzle and rain, dropped suddenly on the machine and blotted everything out. About 100 yards ahead was a stone embankment, while high trees surrounded the aerodrome. There were ships and buoys in the harbour, and high piles out at sea, but, just as the fog dropped, Mr. Cobham noticed that the sea was clear for a few hundred yards on his right. Turning to the right, and seeing nothing at all, Mr. Cobham flattened out and "felt his way" down on to the water, making a successful "landing." All the baggage was lifted on to the top plane, and the passenger and pilot then clambered up beside it, and quietly waited for a boat to take them off.



To be Married

A marriage has been arranged, and will shortly take place, between Flying Officer DENYS A. COX, R.A.F., seventh son of the Rev. W. E. Cox and Mrs. Cox, of Bishopsteignton, and JANE, elder daughter of the late Major JOHN HALL BROWN, of Ceylon, and Mrs. Hall Brown, of Bishopsteignton.

The engagement is announced in Shanghai of Capt. REGINALD E. GREENSMITH, R.A.F., son of Mr. George Greensmith and Mrs. Greensmith, of 155, Sloane Street, S.W. 1, and LUCY, youngest daughter of Mr. THOMAS CRAVEN and Mrs. CRAVEN, of Shanghai.

The engagement is announced of V. TOPPING, M.Sc., Lieut. R.A.F., of Toronto, and AGNES HELEN, eldest daughter

of the late ARTHUR F. WHITE and Mrs. WHITE, Cookham Dene, Chislehurst.

Killed

FREDERICK JOHN ORTWEILER, M.C., B.A., who died at Madrid on February 14 as the result of a flying accident, aged 23, was the eldest son of Mr. and Mrs. S. ORTWEILER, 13, Cavendish Road, Brondesbury. Date of interment will be announced later.

Item

Air Vice-Marshal Sir E. L. ELLINGTON left London on February 23 for Marseilles, there to join the S.S. *Kaisar-i-Hind* for Port Said.

Death of Levavasseur

It is with sincere regret that we have to announce this week the death, on February 23, of Monsieur Levavasseur at the age of 58, after a brief illness. M. Levavasseur was interested in aviation from the earliest days, and it was his designing genius which created the beautiful Antoinette monoplane with Antoinette engine on which the late M. Latham won fame in and after 1907. Recently M. Levavasseur came prominently before the public in connection with his variable area aeroplane, which was acquired by the French Government. It is stated that, like so many

pioneers, M. Levavasseur died a poor man, having spent his whole fortune on experiments in connection with flying.

Honours

In the *London Gazette* of February 21, the Air Ministry announces that H.M. the King has granted unrestricted permission for the wearing of the undermentioned decoration conferred by the King of Italy on the following officer for valuable service in connection with the War:—

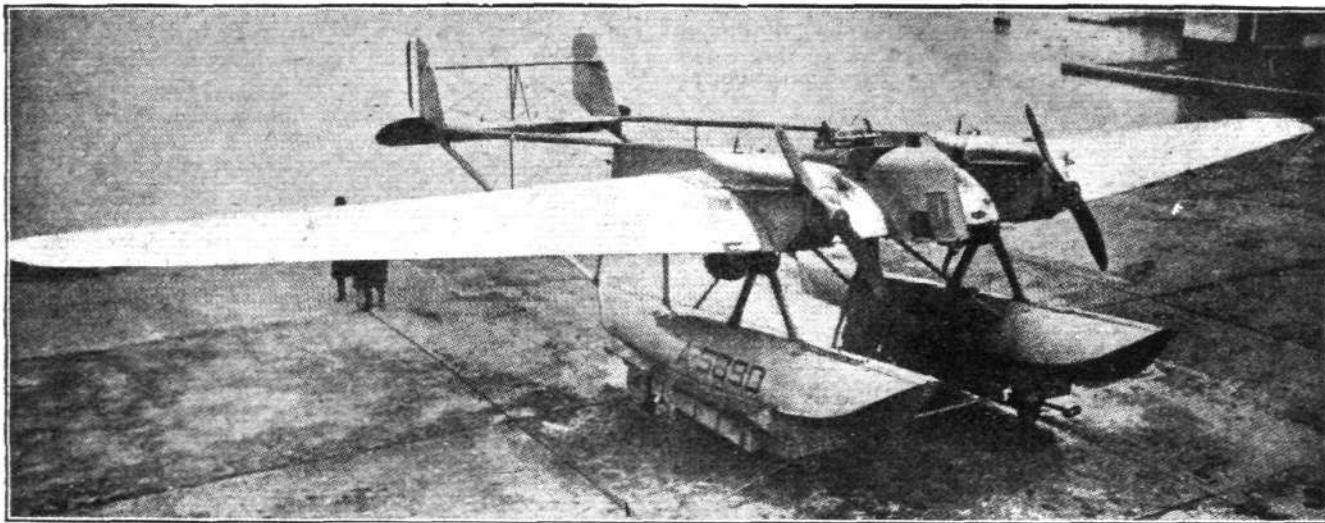
The Order of the Crown (Officer):—Maj. G. de Lacy Wooldridge, O.B.E.

THE CURTISS TWIN-ENGINE TORPEDO SEAPLANE

A Cantilever Monoplane of Novel Design

THE Curtiss Aeroplane and Motor Corporation of Garden City, L.I., U.S.A., has just completed a very interesting type of torpedo 'plane known as the Curtiss C.T. Through the courtesy of our American contemporary *Aviation*, we are able to give our readers the following brief particulars and illustrations of this machine. It is, perhaps, one of the most advanced designs yet produced in the "States," and, judging from general appearances, it certainly seems to be a "business proposition."

projecting forward but slightly beyond the leading edge, located on either side of a main central *nacelle* on the centre section of the wings. The pilot, gunner and bomber are located in the central *nacelle*. Cooling is by two Lamblin radiators mounted under the engine *nacelles* below the wing. The engine instruments are mounted on the side of the *nacelle* in plain view of the pilot. Wood construction is used practically throughout, but in future models it is expected that metal construction will be employed.

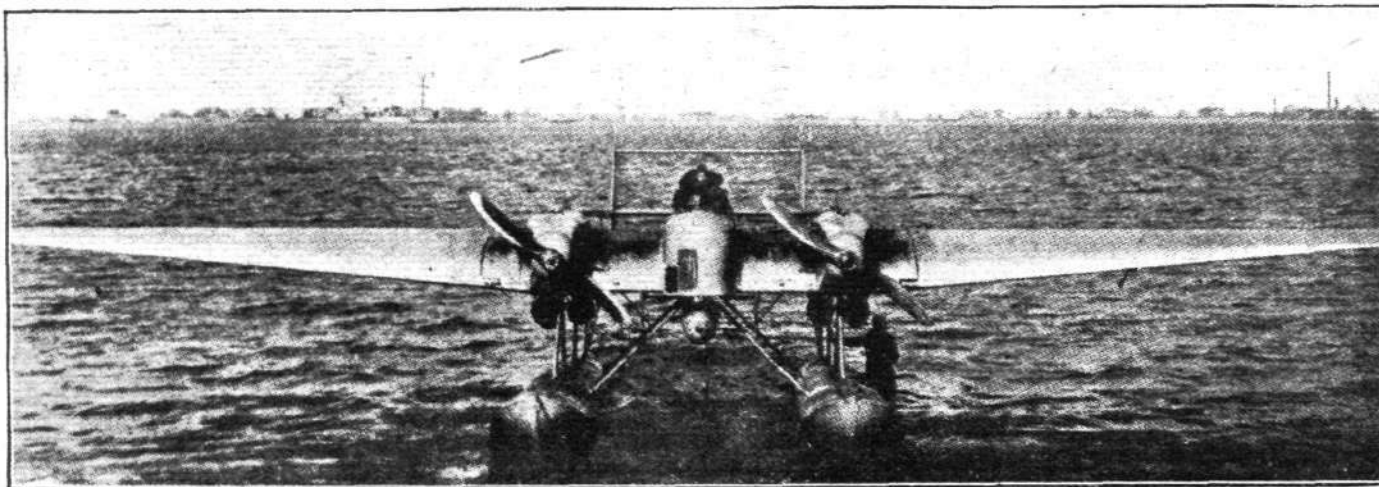


THE CURTISS C.T. TWIN-ENGINE TORPEDO SEAPLANE: Three-quarter front view showing how the tail is carried by outrigger tail booms.

This machine has been built for the U.S. Navy, and was developed by the engineers of the Curtiss Co. working under the supervision of the Naval Bureau of Aeronautics. The problem before the designers was to develop a machine large enough to carry a full-size torpedo, yet be able to manoeuvre quickly and accurately around a hostile fleet, and find without detection the proper position for launching the torpedo. Unlike the big bombing 'planes, which drop their bombs from a great height, when they are more or less free from anti-aircraft fire, the torpedo 'plane must deliver its projectile

The wings are covered with fabric, and taper both in chord and camber from root to tip. They have a span of 65 ft., and the chord at the root is 16 ft. when the maximum thickness is 30 ins.—giving a maximum wing depth of 15.6 per cent. The under-carriage consists of two long floats, one under each engine; they are sufficiently far apart to obviate the need for wing-tip floats, whilst their length likewise dispenses with tail floats.

The *empennage* is supported on outrigger booms, one of a pair running from the rear end of the float and the other



THE CURTISS C.T. TWIN-ENGINE TORPEDO SEAPLANE: A cantilever monoplane with a large pontoon float under each engine; note the torpedo mounted below the central nacelle.

from within a few feet of surface of the water. Therefore, it is essential that the machine be as inconspicuous as possible, and in this respect it is claimed for the C.T. seaplane that, owing to its distinctive design, it more nearly meets these requirements than most other aircraft, for at a distance of about two miles it is said to be practically invisible.

The Curtiss C.T. is a cantilever monoplane with its two engines mounted practically in the wings. These engines, which are Curtiss C.D. 12 of 385 h.p. each (described in *FLIGHT* for Jan. 5 last), are installed in small *nacelles*

from the rear of the engine *nacelle*—the pairs being parallel. There are two vertical fins and two balanced rudders, and a one-piece balanced elevator. The rudders and fins are directly in the slipstream of the airscrews, and the rudder control is rather interesting. There is only one control horn on each rudder, in the space between the latter. The tips of the balanced portions are connected together by a wire, so that a pull on one control horn is transmitted *via* this wire to the other rudder.

This machine has a high speed of 112 m.p.h., and with

one engine running it loses only about 100 ft. per minute. It is expected that with the metal construction the machine will be able to fly level on one engine. The useful load is about 3,800 lbs., consisting of fuel, oil, crew, and a standard torpedo or bomb load.

There are several very ingenious "gadgets" on this

machine, amongst which may be mentioned the stands for the mechanics when working on the engines. These are "shelves" that pull in and out of the wing on each side of the engine nacelles. Hand grips on the sides of the central nacelle and steps on the under-carriage struts provide easy access and exit.

THE INSTITUTION OF AERONAUTICAL ENGINEERS



Notices.—The Council of the Institution of Aeronautical Engineers have received an invitation from the Students' Section of the Royal Aeronautical Society inviting all Members of the Institution to their Lectures. The Council desire to express their thanks, and extend a very cordial invitation to all members of the Students' Section to attend all the Fixtures of the Institution, and to take part in the discussions.

Visit to Napier Works.—On February 15, 1922, Members of the Institution paid a visit to the Napier Works at Acton. They were met by Mr. Mead of the Technical Staff, who conducted them round the works. After inspecting the manufacture of the Napier "Lions" and "Cubs," the visitors were conducted to the test house, where several engines were in progress of testing. One of them was arranged to drive two propellers by shafts out to the inter-plane struts.

Presidential Address.—On February 23, 1922, there was a General Meeting at the Society of Arts, followed by a Presidential Address, and a paper by the new President, Lieut.-Col. Moore-Brabazon, M.C., M.P., entitled "The Early Days of Aviation." The President started by explaining that we must bring to mind the atmosphere of those days, and the fact that one wanted an awful lot of faith to carry on with the work. Anybody who thought of building an aeroplane was ranked in the same category as someone trying to solve perpetual motion, which two problems seemed to go together, and that himself and others were looked on as amiable lunatics.

In all problems which had to be faced from the beginning, an enormous amount of sympathy and encouragement was needed from the public; you did not do your best if you

were being laughed at the whole time. The treatment of Cody, who was at one time the standing joke of the Press, was something of which the nation ought to be heartily ashamed.

He said that if all the work, trials, and disappointments of those early days helped towards the development of that really wonderful exhibition of flying by the Royal Flying Corps during the War, then those early days were not in vain. As in the Grecian torch race, it was the privilege of some to light the torch, carry it awhile in the race, and then hand it to others who outpaced them, might they (the pioneers of aviation), in their turn, hand it on, living, bright and un-flickering, while they, themselves, disappeared in the darkness.

The lecturer showed lantern slides of many old machines, such as the 1907 Voisin, and the 1908 Short, and told the members and visitors many interesting details of the men and machines of those days.

The discussion was one of great interest, the speakers being:—Lieut.-Col. Frank McLean, Major Hume, Commander Perrin, Capt. Sayers, Mr. H. P. Folland.

The Chairman, Mr. Molesworth, in summing up and proposing the vote of thanks to the lecturer, touched on the difficulties of the experimental work at Brooklands.

Fixtures.—March 4: Visit to the Instone Air Line, at the Croydon Aerodrome; members to meet at the Aerodrome at 3 p.m. March 22: Visit to The De Havilland Works of the De Havilland Aircraft Co., Ltd., Stag Lane Aerodrome, Edgware, at 3 p.m.; members to meet at the Works.

Paper, "Seaplane Design," by Mr. W. O. Manning, at the Engineers' Club, Coventry Street, at 8 p.m.

March 31: Paper, "Aircraft Design," read by Mr. Folland, Royal Society of Arts, at 8 p.m.

L. HOWARD FLANDERS,
Secretary

IN PARLIAMENT

Air Operations in Iraq

MR. L. MALONE on February 22, asked the Secretary of State for Air the amount of bombs dropped in Iraq during the past twelve months, the number of bombing operations in which either smoke or shell bombs have been carried, and the names of the towns and villages so attacked?

Captain Guest: Exact information in regard to the particulars asked for is not available. No smoke bombs have been used. Such bombing operations as have taken place have been over unsettled outlying districts, the objective usually being tribal concentrations or encampments which would have no name on the map. A great part of air operations in Iraq consists of mere demonstrations, not involving the dropping of bombs.

Thames Air Station

MR. GILBERT asked whether it has now been definitely decided to use the Thames as an air station; for what air services it is proposed to use the station; whether it is proposed to use the same the whole year round or only during the summer months; can he state approximately when it will be opened; what arrangements have been made for landing passengers, and if it is proposed to set up a Customs Office in order to deal with luggage and merchandise brought to this station?

Captain Guest: The answer to the first part of the question is, that it is the intention of the Air Ministry to carry out further experimental flights for a few weeks, to and from the Thames above Westminster Bridge, in the near future. No definite decision has, however, yet been reached to use this area as the terminal of a regular service, and I regret, therefore, that no serviceable information can be given in reply to the remaining parts of the question.

Aircraft Disposal

SIR W. JOYNSON-HICKS, on February 23, asked the Secretary of State for Air whether the contract between the Disposals Board and the Aircraft Disposals Company expires in the middle of March; and whether the Air Ministry has been consulted as to its renewal?

Captain Guest: I understand that the Disposal and Liquidation Commission are considering the revision of their agreement with the Aircraft Disposal Co. The Air Council have given their views to the Commission on the points which concern the Council. The matter is now in the hands of the Disposal and Liquidation Commission, and any further question on the subject should, therefore, be addressed to the Financial Secretary to the Treasury.

American Bankers Make a Record Air Trip

A PARTY of important Wall Street financiers, headed by Charles E. Mitchell, President of the National City Bank, and Percy G. Rockefeller, arrived at Key West recently en route for Havana. Upon learning that the trip across the Gulf by steamer required about 8 to 10 hours, they chartered one of the Aeromarine 11-passenger flying boats (the "Ponce de Lion") and made the flight to Havana in 70 minutes—

Mileage Flown by R.A.F.

MR. MALONE asked the Secretary of State for Air the mileage flown by service aircraft, by classified types if available, during 1920 and 1921, showing what part of this mileage was flown in the British Isles and what part was flown on active service?

Captain Guest: Figures for 1920 are not available. For 1921 the total mileage flown by service aircraft was, approximately, 5 million miles, of which 53 per cent. was flown in the British Isles and 47 per cent. overseas. I cannot give figures for the various types.

Aircraft

MR. MALONE asked the Secretary of State for Air the numbers and types of aircraft (landplanes and seaplanes) in flying trim now in possession of the Air Ministry, and showing how many are situated in the British Isles?

Captain Guest: There are 1,938 machines on the establishment of the Royal Air Force, of which 773 are actually in active use in squadrons and training units, and are supposed to be serviceable. The remainder are held as reserve. Of the 773 in active use, about 70 to 75 per cent. may be reckoned upon as serviceable, that is, in flying trim; but the number varies, of course very considerably, from day to day and from hour to hour.

The types are as follows:—Snipe, Avro, Bristol Fighter, D.H.9A., D.H. 10, Vickers Vimy, F.2A. and F.5., Vickers Ambulance, Vickers Vernon, Fairey 3 D., Fairey 3 C., Westland Walrus, Sopwith Cuckoo, Panther, and Sopwith Camel.

R.A.F. Personnel

MR. MALONE, on February 27, asked the Secretary of State for Air the number of officers and men in the Royal Air Force, showing how many are fully qualified pilots and how many are employed in the British Isles?

Captain Guest: The answer to the first part of the question is: officers 2,926, airmen 26,207. Of the total number of officers, 2,398 are on the General List and 528 are on the list for non-flying duties, namely stores, medical, etc. As regards the second part of the question, all officers on the General List are liable to employment on flying duties if medically fit, and, at present, 1,862 are fully qualified pilots. The remainder, namely, 536, are not qualified pilots, and consist partly of observers and partly of technical officers who were retained for the interim period only, including 200 naval warrant officers completing their time to qualify for pension. The answer to the third part of the question is 2,089 officers, 19,506 men and boys. These figures include officers, airmen and boys under training.

establishing a record for this voyage. Owing to the large amount of luggage belonging to the party, another flying boat was employed to carry it, and the entire party with their luggage arrived in Havana before the steamer had left its dock at Key West. The latter part of the trip was made in a driving rain-storm, but, thanks to the luxuriously appointed enclosed cabin, the passengers were in no way discomforted.

THE ACCIDENT TO H.M. AIRSHIP "R.38"

Report of Accident Investigation Sub-Committee Issued

THE official Report on the investigations into the details which contributed to the loss of "R.38" have now been issued by the Air Ministry. The Report itself covers 27 typewritten foolscap pages, and at the end of the Report are eight appendices, bringing the total of the subject-matter up to 57 typewritten pages. The technical appendices are illustrated by 10 diagrams showing construction, aerodynamic loading, bending moments and shear force diagrams of the ill-fated airship. The membership of the Sub-Committee for the purpose of the investigation on "R.38" was as follows:—Lieut.-Col. Mervyn O'Gorman, C.B. (Chairman), Prof. L. Bairstow, C.B.E., F.R.S., Wing-Comdr. T. R. Cave-Browne-Cave, C.B.E., R.A.F., Mr. G. B. Cockburn, Mr. M. A. Doyle, Sir R. T. Glazebrook, K.C.B., F.R.S., Lieut.-Col. E. Gold, D.S.O., F.R.S., Sqdn.-Ldr. R. M. Hill, M.C., A.F.C., R.A.F., Sir J. E. Petavel, K.B.E., F.R.S., Maj. G. H. Scott, C.B.E., R.A.F., Dr. A. J. Sutton Pippard, A.M.Inst.C.E., F.R.Ae.S., Mr. H. B. Irving, Secretary (Assistant Secretary, Aeronautical Research Committee).

In attendance—Comdr. H. T. Dyer and Mr. C. P. Burgess, of the United States Navy.

The main conclusions arrived at by the Committee are set out in the following summary:—

The Committee have examined the essential witnesses and have studied the reports of the Court of Inquiry and of the Admiralty Committee appointed to investigate the history of the design and early stages of construction, and in addition have pursued their own investigations. They have arrived at the following conclusions:—

a. That the accident was due to structural weakness in the design of the airship.

b. That during the final flight no loads were imposed in excess of those which might have occurred during the normal navigation of the ship in weather which might reasonably be encountered.

c. That, having regard to her size and speed, "R.38" was considerably weaker than previous British rigid airships.

d. That the provision of specially powerful control surfaces of new design virtually accentuated this weakness.

e. That during design no calculations were made of the stresses due to the aerodynamic forces to which the ship would be subjected.

f. That in consequence, the calculations made by the design staff, taking specific account only of the forces and moments due to the distribution of weight and buoyancy, including gas pressures, were misleading.

g. That, owing to instability of the airship, the movements of the controls necessary to keep her on any particular course were large and rapid.

h. That the structure was not improbably weakened by the cumulative effect of reversals of stress of magnitude approaching the failing stress.

i. That in the construction of such an airship, reference to first principles in design is necessary, and that for progressive development of airships in size and speed, it was not sufficient to place exclusive reliance on a comparison with existing ships using the routine methods adopted for "R.38."

k. That the existing methods of calculation at present in use for determining the scantlings of structural members of an airship are insufficiently accurate for this purpose and that more exact methods should be developed.*

l. That research by both model and full-scale experiment is essential to determine and verify the forces to which an airship is subjected.

m. That the terms of the requirements laid down in time of war for "R.38" were drastic and imposed too severe a task on the designers.

n. That when the design was originally laid down information as to aerodynamic forces existed; which should have led to a detailed consideration of the effects of these forces and to consultation with the Advisory Committee for Aeronautics as to the dangerous loads foreshadowed by the model experiments on aerodynamic pressures then available.

o. That faulty material did not contribute to the accident.

p. That on the assumptions made, the structure was designed with great skill and the necessary calculations were carefully carried out by methods admitted as sufficiently accurate in other branches of engineering practice.

* The Air Ministry have recently approved the formation of a Panel of the Aeronautical Research Committee having as terms of reference to consider the validity of the methods at present in use for calculating the strength of rigid airships and to endeavour to indicate other methods which would enable a closer basis of design to be obtained.

q. That the weather at the time did not contribute to the accident.

(Signed) MERVYN O'GORMAN, Chairman,
Accidents Investigation Sub-Committee.

January 30, 1922.

The first part of the report gives a brief history of the airship and its three first flights. The fourth and fatal flight, which commenced on August 23, is dealt with next. In dealing with the basis of design of R.38, the committee states in the report that "In the stress calculations which were made by the design staff, the airship was assumed throughout to be in the static buoyant condition: the stresses which would be imposed due to the additional air pressures when in flight were not calculated." It is further stated that, in October, 1919, when the airship was transferred to the Air Ministry, no marked reduction of the requirements was made, although the military urgency had disappeared, and the report proceeds to give an indication of the results that could have been attained at a slight sacrifice in disposable lift. Thus it is stated that, if the strength of the main longitudinal girders had been doubled, without altering the type of girder, the disposable lift would have been reduced by less than four tons, which would have reduced the ceiling by about 2,800 ft.

On the subject of the very great importance of the stresses set up by aerodynamic forces, the report points out that under certain conditions which are to be expected in flight, stresses due to aerodynamic forces may be produced in the structure which will considerably exceed those due to the weights and buoyancy, and that the provision of even a large margin of strength against the latter is no guarantee that the structure will withstand the stresses induced by a quite normal manoeuvre. Treating the ship as a continuous beam, the bending moment when the ship is flying pitched at 10 degrees is found to be slightly less than the moment which, according to the calculations of the design staff, would have caused failure. The factor of safety is found to be not the figure four which had been intended, but only about one. It is further pointed out that these calculations were made for conditions which may occur in flight, but that it is improbable that the conditions chosen represent the worst possible. It thus appears to be clearly established that R.38 had an insufficient margin of strength to withstand the stresses due to manoeuvres which might be necessitated during normal flight, or be directly due to bad weather.

With regard to the opinion that failure of certain amidship girders, during the third flight of the airship, was due to the effect of the slip-stream from one of the propellers on the structure, the Committee does not agree with this view, but hold that the buckling then reported, was due to the existence of dangerous stresses set up by the "hunting" of the airship at high speeds and its correction with the elevators.

The Appendices

Appendix I contains leading particulars and scheme of construction of R.38. In Appendix II is given a brief history of the airship up to and including the time of the third test flight. The respects in which R.38 differed from previous British and German airships are pointed out, from which it appears that circumferential and "catenary" wiring were employed in place of netting to contain the gas bags, which were 15 metres long, filling entirely the space between two main frames. The corridor support wires fitted in the later German ships were omitted in R.38. The fins were of triangular section and of the cantilever type. Her controls were very powerful, but, probably as a result of the proportion of fin and control surfaces, she proved more difficult to control than R.33.

Appendix III is a note by Lieut.-Col. E. Gold, A.D.M.O., on the weather conditions at the time of the accident to R.38, while in Appendix IV is contained a report on investigations relating to the aerodynamic forces and moments on airships. The latter appendix is divided into three parts, of which Part I gives the reports available at the time R.38 design was first started (August, 1918). Part II gives the reports which became available between October, 1919 (when the ship was transferred to the Air Ministry), and the date of the first trial of the airship. In Part III is given a list of the reports which became available since the first trial flight.

The relative strengths of R.38 and R.33 are dealt with in Appendix V, which indicates that the strength required

in R.38 was of the order of double that required in R.33, whereas, in fact, the resistance to bending offered by the two ships was about the same.

Prof. L. Bairstow, in Appendix VI, deals very fully with the question of the aerodynamic loading of R.38, from which it appears that the factor of safety of the ship under conditions known to have existed was not above 2, and, under conditions which might easily have occurred, not above 1.

THE "ROMA" DISASTER

SINCE the brief reference in our last issue to the regrettable disaster which overtook the U.S. (ex-Italian) dirigible "Roma," on the 21st ult., some further particulars have come to hand. These, however, are still somewhat vague and uncertain as to the actual happenings during this fatal flight.

The total number on board is given as 45, out of which there are only 11 survivors, the majority of whom are more or less severely injured or burned. Capt. Mabry, commandant of the "Roma" and principal pilot, is among the dead, and it would seem that he stuck to his post to the end, as his charred body was found later with the hands still grasping the control wheel.

Some of the survivors had most extraordinary escapes, one, Lieut. Burt, jumping out of the ship the moment after the explosion, landed in some soft mud 30 ft. below, and was practically unhurt. As to the cause of the accident, accounts vary somewhat in certain details, but the following report from *The Times* correspondent furnishes about the best explanation we have seen:—

"It seems that the airship became unmanageable when at an elevation of about 1,500 ft. Observers below then saw a huge kitelike structure under the tail cone swing loose at an angle of 45°. For a moment it seemed that the 'Roma' was about to capsize. It took a nose-dive and fell rapidly to the ground. Some of those watching the catastrophe declare that the flames burst from the gasbag, but this is not confirmed by survivors, though two of the dead were afterwards found grasping fire extinguishers.

METHODS OF AEROPLANE FLYING INSTRUCTION

UNDER above title a paper was read before the Royal Aeronautical Society on February 16, 1922, by Squadron-Leader C. F. A. Portal, D.S.O., M.C. The lecturer commenced by outlining the two main methods of teaching which were in vogue in 1915. One of these consisted in using dual-control machines, in which the pupil was taken up, with his hands on the controls but not actually controlling the machine. After a number of flights of this nature, the pupil was sent up for his first solo flight, and it was not until he went into the air alone that he began to acquire any real knowledge. The second type of school started straight away with solo machines, but the power of the engines with which these were fitted was carefully graduated, commencing with one of such low power that the machine could not be coaxed into the air with it. From this machine, having got used to engine and machine controls (and incidentally the noise of the engine), the pupil was put on machines with higher power, doing "hops," "straights" and, finally, landings and turns.

The lecturer then outlined the present system of tuition, which has resulted from the "Instructional Revolution" of 1916. One of the most important innovations is, perhaps, the introduction of the telephone, by means of which the instructor can tell the pupil of any mistake made in controlling a machine. The Avro was chosen as the standard elementary training machine, and the present system was devised for this machine, although it is applicable to almost any other single-engined tractor.

Briefly, the procedure is as follows: The pupil is put into the back seat, the instructor occupying the front seat. A telephone connects the two. The machine is then taken up to a height of about 1,000 ft., and the instructor proceeds to explain the use of the controls, demonstrating their effect as he goes along. The next step is to give the pupil entire control, telling him to keep the top of the engine cowl level with the horizon, the two wing tips level with one another, and the nose of the machine pointed to some land mark. At first, the pupil rarely manages to do all of these things, but gradually he acquires mastery to the extent of being able to fly straight and level. He is then shown the climbing and gliding angles of the machine, and told to note mentally the apparent distance between the top of the cowl and the horizon. The next lesson consists in teaching the pupil to do turns. Then follow flights, in which he is taught to do

The manoeuvres during the last half hour of flight are described in Appendix VII, and from this it appears that the tests which were in progress were necessary, and that the control movements employed were not unduly violent. The last Appendix, VIII, by R. A. Frazer, B.A., B.Sc., and H. Bateman, B.Sc., A.C.G.I., D.I.C., contains an estimate of the lateral force on the upper rudder of R.38, together with a diagram and curves.

"From various parts of the airship came hurtling to the ground a shower of sandbags, followed by two or three bodies of men who jumped. The airship skirted the chimney stacks of buildings at the Army base, and fell plump upon some high-tension wires. A terrific explosion followed and the mammoth gasbag turned over on the cabins, whose occupants were precipitated into the roaring flames."

Thus it would appear that the breaking of the rudder was the original cause of the accident, and it is the opinion of many that had the "Roma" been a little higher when the control broke down, the dirigible would have cleared the buildings and come down in the water—Hampton Roads—off the station, and probably most, if not all, of the crew would have been saved. Others state that if the "Roma" had been filled with helium gas instead of hydrogen the contact with the electric wires would not have caused the outbreak of fire with its terrible results, and the "Roma" would only have crashed on to the buildings with nothing like such serious loss of life. However, full investigations into the disaster are being made by experts, and no doubt further light will be thrown on this unfortunate affair.

The Secretary of State for Air has sent a telegram in the following terms to the United States Secretary for War, through the British Air Attaché at Washington:—

"On behalf of the Air Council I offer to you and to the United States Army our profound condolences on the deplorable loss of the airship "Roma," with so many valuable lives. (Signed) FREDERICK GUEST, Secretary of State for Air."

loops, rolls, spins, etc. Up to this point about five hours have been spent in the air. Finally, the pupil is taught to get off and land correctly, and not until he can do so is he sent up for his first solo flight, which, needless to say, is not nowadays the nerve-racking affair it used to be in the old days. After further practice solo, the pupil has to practice "forced" landings, and gradually he becomes proficient.

THE ROYAL AIR FORCE MEMORIAL FUND

A MEETING of the Executive Committee of the Fund was held at 7, Iddesleigh House, Caxton Street, on February 15. Lord Hugh Cecil in the chair.

A draft statement of accounts was submitted by the Fund's auditors, Messrs. Blackburns, Barton, Mayhew and Co., for the year 1921.

The Committee were unanimously of opinion that the accounts as presented were very satisfactory in so far as the evident use of the Fund in the relief of distress, and in the furtherance of the objects with which it was started, had been carried out during the year in question. All the objects with which the Fund started, with the exception of one, have been or are being carried out, the one exception being that the scholarships for the sons of officers who fell in the War have not yet materialised, in view of the fact that one of the two houses at Ascot so kindly presented to the Fund by Mrs. Salting has not yet been sold.

Another point which the Committee regard as highly satisfactory is the fact that the activities of the Fund as regards the distribution of assistance to the needy of all ranks who fought with the Air Force during the War has very greatly increased, and is proof of the usefulness of the Fund. The grants made during five months of 1920 roughly amounted to £900, whereas during the year 1921 this sum rose to £4,500.

As regards the War Memorial on the Thames Embankment, it was reported that active work had begun on the stonework in the contractor's yard, and that Mr. Reid Dick, selected by the architect, Sir Reginald Blomfield, R.A., was actively engaged on the modelling of the bronze eagle and globe. The architect hopes to keep the cost of the Monument within £7,000, which is considerably less than was first estimated.

A proposal to hold an R.A.F. ball at some London hotel, as was done in 1920, was postponed for consideration later on in the season.

THE ROYAL AIR FORCE

London Gazette, February 21, 1922

General Duties Branch

Observer Offr. C. D. Palmer (Lieut., A. and S. Highrs.) is granted a permanent commn., retaining his present substantive rank and seny.; Nov. 17, 1921. Flying Offr. A. C. Sanderson, D.F.C., is granted a permanent commn., retaining his present substantive rank and seny.; May 10, 1920. *Gazette* May 18, 1920, appointing him to a short service commn. is cancelled. Lieut. T. W. Shortridge (R. Innis. Fus.) is granted a temp. commn. as a Flying Offr. on seconding for four years' duty with R.A.F.; Jan. 19. Pilot Offr. on probation J. B. H. Rogers is confirmed in his rank; Feb. 8. Flying Offr. S. A. H. Bowyer resigns his short service commn., and is granted the rank of Capt.; Feb. 8 (substituted for *Gazette*, Feb. 7.) Flying Offr. G. Croft is placed on the ret'd. list; Feb. 22.

Stores Branch

Flight Lieut. F. G. M. Williams is granted a permanent commn., retaining his present substantive rank and seny.; Jan. 2. Flying Offr. C. J. Polden is granted a permanent commn., retaining his present substantive rank and seny., with effect from Sept. 12, 1919, and is transfd. to Stores Branch, with effect from Dec. 17, 1921. *Gazette*, Sept. 12, 1919, appointing him to a short

service commn., is cancelled. Pilot Offr. S. Bingham is granted a permanent commn. as a Flying Offr., with effect from, and with seny. of, Sept. 12, 1919, and is transfd. to the Stores Branch, with effect from June 17, 1920. *Gazette*, Sept. 12, 1919, appointing him to a short service commn., is cancelled.

Medical Service

T. M. Walker is granted a temp. commn. as a Flight Lieut., with effect from, and with seny. of, Feb. 9.

Nursing Service

The follg. are confirmed in their appointments as Staff Nurses.—Miss E. M. Clements; Aug. 2, 1921. Miss M. A. MacVicar, Aug. 3, 1921. Miss E. S. Browbank; Aug. 9.

Memoranda

Pilot Offr. A. M. Anderson, D.F.C., to be Observer Offr.; Oct. 18, 1919 (since resigned). Hon. Sec. Lieut. C. S. McKay relinquishes his hony. commn. on joining the I.A.; Nov. 21, 1921. Lieut. A. Frickett relinquishes his temp. commn. on account of ill-health contracted on active service, and is permitted to retain his rank; Feb. 22. Lieut. H. P. L. Gardner relinquishes his temp. commn. on return to Army duty; March 14, 1919 (substituted for *Gazette*, June 24, 1919) since relinquished).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified—

Flight Lieuts.—S. M. Kinkead, D.S.O., D.S.C., D.F.C., from No. 24 Squadron (Inland Area) to No. 30 Squadron (Iraq Group). 31.1.22. C. G. Hetherington, M.B.E., from Headquarters, No. 11 (Irish) Wing to School of Photography. 1.2.22. (The notice appointing this officer to School of Technical Training (Men) with effect from 1.2.22 is cancelled.) C. J. W. Darwin, D.S.O., from R.A.F. Cadet College (Ground Wing), Cranwell, to Headquarters, R.A.F., Cranwell. 1.2.22. W. B. Farrington, D.S.O., from Boys' Wing, Cranwell, to Headquarters, R.A.F., Cranwell. 1.2.22. A. L. Messenger, A.F.C., from No. 3 Flying Training School (Cadre) (Inland Area) to Half-pay List, pending embarkation overseas. 11.2.22. I. Cullen, A.F.C., from No. 5 Flying Training School (Inland Area) to Armament and Gunnery School (Cadre) (Inland Area). 1.3.22. D. H. W. Williamson from R.A.F. Depot (Inland Area) to Electrical and Wireless School (Inland Area). 3.2.22. E. Drudge, M.B.E., from Half-pay List to Headquarters, Iraq Group. 4.2.22. H. H. Mallett to R.A.F. Depot (Inland Area), on attachment from Army Dental Corps. 1.2.22. H. E. F. Wyncoll, O.B.E., M.C., from No. 7 Group Headquarters (Inland Area) to R.A.F. School (India). 2.2.22. H. V. German from Half-pay List to Headquarters, Iraq Group, for duty at R.A.F.

Short Service Commissions—Period of Service

It is notified for general information that all officers who applied for Short Service Commissions, under the conditions of Air Ministry Weekly Order No. 781 of 1919, after November 17, 1920, were informed that the period of active service had been extended to four years.

The Gazettements were carried out as follows:—

(a) From the inception of the Short Service Commission scheme all appointments notified in the *London Gazette* up to and including the issue of January 25, 1921, were for three years on the active service list, unless otherwise stated.

(b) All appointments notified after January 25, 1921, were for four years, unless otherwise stated.

The engagements of all officers entered under the conditions of Air Publication 793 are for four years on the active list.

Firearms Act, 1920

ATTENTION is drawn to the provision of the Firearms Act, 1920, which places certain restrictions upon the purchase, possession and use of firearms. The following observations are for the guidance of officers and airmen:—

1. **Firearms and Ammunition required for Duty.**—No restrictions are imposed, nor is certification required, for the possession or use by R.A.F. officers and airmen of any firearms or ammunition in the performance of their official duty.

2. **Purchase by Officers of Revolvers and Revolver Ammunition.**—R.A.F. officers require to obtain a certificate from the police in order to buy a revolver or ammunition for their personal use. The Home Office have agreed and have notified the police that no fee will be charged to a commissioned officer for the grant of such a certificate if he produces to the Chief Officer of Police a certificate from his commanding officer that he requires the revolver or ammunition in his capacity of officer.

3. **Section 6 of the Firearms Act, 1920,** prohibits the manufacture, sale, possession, etc., of any weapon designed for the discharge of noxious liquids, gases or other noxious elements. Such a weapon is a prohibited weapon, and R.A.F. officers are not entitled to private possession of such weapons, although it may, as part of their official duty in an R.A.F. establishment, fall to them to experiment with or use such weapons. To avoid the penalties of this section, therefore, any R.A.F. officer who desires to purchase or possess such weapons or to keep or take them outside R.A.F. establishments should apply to the Air Ministry for permission to do so. Such permission will not be granted without good cause.

Prison (on formation). 2.2.22. R. E. Nicholl from Central Flying School to Headquarters, Iraq Group. 2.2.22. F. St. John Woollard, A.F.C., from No. 5 Flying Training School (Inland Area) to No. 4 Flying Training School (Middle East Area). 3.2.22. A. H. Pearce, D.F.C., from Headquarters, R.A.F. (India), to Iraq Group Headquarters (Middle East Area). 12.1.22. W. S. Magrath from No. 84 Squadron (Middle East Area) to No. 14 Squadron (Middle East Area). 30.11.21. Hon. R. A. Cochrane, A.F.C., from Headquarters (Middle East Area) to No. 45 Squadron (Middle East Area). 7.1.22. W. H. Dunn from No. 5 Squadron (India) to R.A.F. School (India). 14.12.21. E. A. Fawcus from R.A.F. Depot (Inland Area) to No. 1 School of Technical Training (Boys) (Halton). 13.2.22. G. D. Nelson, D.S.C., A.F.C., from No. 1 School of Technical Training (Boys) (Halton) to Air Ministry (Directorate of Training and Organisation). 27.2.22. E. J. Cooper, D.S.C., from School of Naval Co-operation and Aerial Navigation (Coastal Area) to No. 230 Squadron (Coastal Area). 8.2.22. R. W. G. West from No. 1 Squadron (Middle East Area) to Armament and Gunnery School (Inland Area). 24.12.21. O. A. Armer, from Electrical and Wireless School (Inland Area) to R.A.F. Depot (Inland Area). 7.2.22. A. Fitz-Roy Somerset-Leeke, from Iraq Group Headquarters (Middle East Area) to Aircraft Park, Iraq (Middle East Area). 29.12.21.

4. Further instructions will be issued in regard to the importation into and exportation from the United Kingdom of firearms, ammunition, etc.

Seaplane Floating Dock Tests

BUILT under arrangement with the Admiralty at Sheerness Dockyard, the Seaplane Floating Dock, designed for the Royal Air Force, and floated on September 4 last year, has been subjected to trials off Sheerness before being handed over to the Air Ministry. The tests included towing trials and anchor trials, and the dock was also submerged, a seaplane being docked on the pontoon. The tests were satisfactory in every respect, and the dock was towed back to Sheerness yard to be completed for delivery. The dock is fitted for the reception of two seaplanes of the latest type. The trials were under the superintendence of representatives of the Admiralty and Royal Air Force, and were conducted by officials of Sheerness Dockyard.

Safety Fuel Tank Competition

THE final tests of the tanks selected by the Judges Committee in the Air Ministry Competition for safety tanks for aircraft took place at the Royal Aircraft Establishment, Farnborough, this week on February 20 and 22.

On the first day the trials consisted of acceleration and crashing tests, and on the second day of firing tests.

Twenty-six entries were received for the competition, which, it will be remembered, was being held in order to obtain, if possible, a tank which will withstand the shock to which it may be subjected in an aeroplane crash without either bursting or leaking, thus eliminating almost entirely the possibility of fire, and which will also withstand the effects of enemy action by machine gun and shell fire.

As a result of the preliminary tests, which began on December 5, the following tanks, which are of radically different types, were selected to undergo the final tests:—

"Boothby" gas armoured tank, submitted by Commander F. L. M. Boothby.

"Imber" self-sealing tank, submitted by Messrs. Imber Anti-fire Tanks, Ltd.

Tank submitted by India Rubber and Gutta Percha Co., Ltd. The crashing tests are similar to those to which the tanks were subjected during the preliminary trials, in addition to special tests to determine the resistance to acceleration.

In the firing tests the tanks were subjected to machine gun fire with ammunition capable of penetrating the ordinary type of mild steel fuel tank and of exploding and igniting the fuel either on contact or after penetration.

THE LONDON AERO-MODELS ASSOCIATION

A GENERAL Purposes Committee Meeting of the above Association was held at 20, Great Windmill Street, Piccadilly, W. 1, and the programme of competitions for the ensuing three months was decided upon.

The first of these competitions will take place on March 25 at the above address, and applications for entry forms, etc., should be addressed to Mr. A. Rippon, 52, Fairbridge Road, Holloway, N. 19, who has kindly consented to act as Competition Secretary for the ensuing year. This first competition is an indoor bench test for propellers of a diameter of 12 ins. and a pitch of 18 ins. All propellers entered must be bored at the boss with a $\frac{1}{8}$ -in. hole. The power used will be compressed air, a plant having been very kindly lent by Mr. F. J. Camm and a Michelin air cylinder by Mr. Felix Kelly. Mr. A. B. Clark will act as judge. This competition will be open for carved propellers only, the number of blades being limited to two. The propellers registering the best thrust will be awarded first, second and third prizes in order of merit. The prizes for this competition have been very kindly presented by Mr. H. J. Best, to whom a hearty vote of thanks was proposed and carried unanimously.

Particulars of other competitions will be announced in due course, and it is hoped that all members will earnestly endeavour to enter for this, the first competition of the New Year. Country members' propellers may be sent to Headquarters at 20, Great Windmill Street, Piccadilly, W. 1, where they will be looked after and returned after the test. Country members should pay carriage.

A. E. JONES, Hon. Secretary.



A Model Club for Brighton and Hove

As a result of the announcement in respect to the above, which appeared in our issue for February 16 last, we are pleased to hear from Mr. A. L. Churcher that the desired Club is now well in the making—the loan of a workshop and meeting rooms having been obtained. It is proposed to hold the first General Meeting on March 8 next (7.30 p.m.) at 12A, Goldstone Street, Hove, when it is hoped that those interested will make an effort to be present.

Airship Developments in the United States

So far from the dreadful disaster to the "Roma" having set back airship progress in America, developments on the most extensive scale are since reported from Washington. The United States Chamber of Commerce announces the formation of an important corporation for exploiting commercial air navigation in the United States by regular lines of dirigibles of the Zeppelin type. The corporation is named "The General Air Service," and definite plans, the report states, for the construction of craft in Germany have been formed.

It is expected to place two ships in operation in the summer of 1923. The route to be operated with these first airships is the Chicago-New York line. Mr. Benedict Crowell, of Cleveland, former Assistant United States War Secretary, also head of the American Aviation Mission to Europe, and president of the United States Aero Club, is stated to be the first president of the corporation. Other backers are Mr. Marshall Field, Mr. L. V. Benet, president of the Hotchkiss Company, Col. Charles De Forest Chandler, Mr. E. N. Herr, president of the Westinghouse Company, Mr. Theodore Pratt, of the Standard Oil Co., Mr. Franklin D. Roosevelt, Mr. Benjamin Thaw, of Pittsburg, and Mr. David Goodrich, of New York.

The first Chicago-New York line will eventually be extended to the Pacific coast, and later bigger craft will be utilised for lines to South America and Europe. The first aircraft will be of 4,000,000 cubic ft. capacity, and although manufactured in Germany, it will be erected in America. It will accommodate 100 passengers and 30 tons of freightage. Johann Schuette, of the Schuette Lanz Co., Germany, is now in the States with a corps of engineers on his second visit working out details of construction and routes. Schuette declares that virtually there will be transferred later a large part of the German Zeppelin-making business to the United States.

Iraq Group an Independent Command

THE Iraq Group which has formed part of the Middle East Area became an independent command with effect from 1st February, 1922.

The Officer Commanding, Iraq Group, is directly responsible to the Air Ministry for the command and administration of the Air Force units located in Iraq.

SIDE-WINDS

An interesting set of six post cards, reproduced from photographs taken during the Ross-Smith flight to Australia, were produced by the Photochrom Co., Ltd., of 7-10, Old Bailey, London, E.C. 4, in connection with the Lowell Thomas "Travelogues" or lectures on the above flight given recently. We understand that these cards are now on sale in the ordinary way, and a set may be obtained from the Photochrom Co., at the above address, on receipt of 6d., plus postage.



PUBLICATIONS RECEIVED

The Airplane Engine. By Lionel S. Marks, B.Sc., M.M.E. London and New York: McGraw-Hill Book Co., Inc. Price 30s. net.

Technical Note No. 83. The Theory of the Screw Propeller. By A. Betz. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.



NEW COMPANIES REGISTERED

BUCKINGHAM ENGINEERING CO., LTD., Holyhead Road, Coventry. Capital £10,000 in £1 shares. Under agreement with J. F. Buckingham, and W. Maddocks, manufacturers of and dealers in aircraft, motor-cars, etc. T. C. John, first sole permanent director.

R.A.F.C. CO., LTD., 128, Piccadilly, W.—Capital £1,000, in £1 shares. Objects, to hold premises acquired by nominees on behalf of the company and intended to be occupied by the Royal Air Force Club at 128, Piccadilly, and 6, Park Lane, W. First directors: A. Colls, J. L. Walsh, and W. J. H. Harcourt.

THE TRIPLEX SAFETY GLASS CO., LTD., Fitzalan House, Arundel Street, Strand, W.C.—Capital £85,000, in £1 shares. Under agreement with the Central and Western Corporation, Ltd. First directors, Col. Sir Harry Waechler, Bt., C.M.G., H. N. Hoare, D.S.O., E. J. F. C. Allen, R. G. M. Delpech and W. R. Lyttleton.



AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motors. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1920

Published February 23, 1922

30,050. F. J. SMITH and W. HIBBERT. I.C. rotary engines. (174,434.)

Published March 2, 1922

34,925. SPERRY GYROSCOPE CO. Gyroscopic compasses. (155,257.)
35,759. SOC. DES MOTEURS SALMON (SYSTÈME CANTON-UNNE). Means for securing rotary members of contractile material to metallic hubs. (157,892.)

APPLIED FOR IN 1921

Published February 23, 1922

6,818. ZEPPELINWERKE GES. Fuselages or hulls of aircraft. (164,305.)

Published March 2, 1922

3,936. H. JUNKERS. Aeroplanes. (158,848.)

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